

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



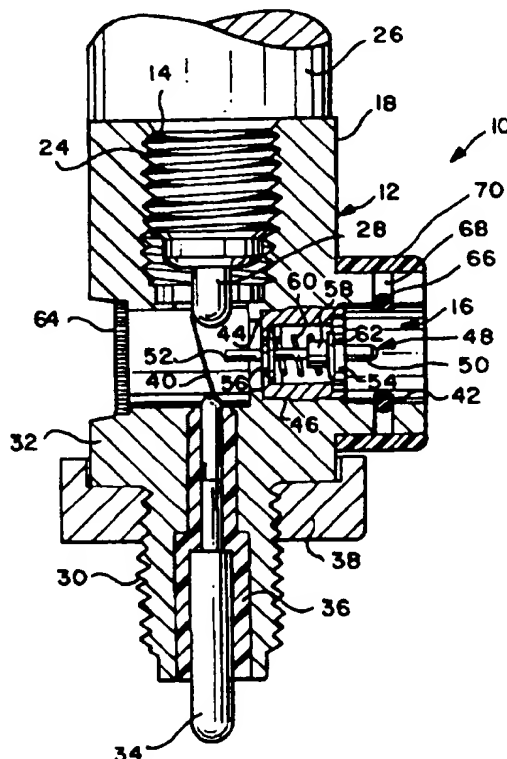
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>H01R 17/12, 13/703</b>		<b>A1</b>	(11) International Publication Number: <b>WO 97/23929</b>
			(43) International Publication Date: 3 July 1997 (03.07.97)
(21) International Application Number: PCT/US96/20002		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 19 December 1996 (19.12.96)			
(30) Priority Data: 08/576,345 21 December 1995 (21.12.95) US			
(71) Applicant: ERICSSON INC. [US/US]; 7001 Development Drive, P.O. Box 13969, Research Triangle Park, NC 27709 (US).			
(72) Inventors: SCHIMMOELLER, Leon; 130 Ivy West Drive, Forest, VA 24551 (US). YOON, John; 224 Norfolk Avenue, Lynchburg, VA 24503 (US).			
(74) Agent: KEENAN, Michael, J.; Nixon & Vanderhye P.C., 8th floor, 1100 North Glebe Road, Arlington, VA 22201-4714 (US).			
		Published With international search report.	

(54) Title: COAXIAL ACCESSORY CONNECTOR

(57) Abstract

A coaxial accessory connector adapted to fit within an RF port of a communications device, the coaxial accessory connector comprising a housing having a first port and a first contact element; a second port including a second contact element; and a switch element located in the housing and connected to the first contact element and, in a first position, engageable through the first port, and wherein the second contact element is engageable through the second port and movable into contact with the switch element to move the switch element away from the first position.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LJ	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

## COAXIAL ACCESSORY CONNECTOR

This invention relates to a coaxial accessory connector which allows an accessory item to disconnect a radio or telephone device from its own antenna  
5 and redirect the RF energy through the coaxial accessory connector to the accessory.

## BACKGROUND AND SUMMARY OF THE INVENTION

10

Many two-way radios and cellular telephones have external RF connectors and internal RF switches which add to the size and cost of the units. This feature allows an accessory item to disconnect the radio/telephone from the antenna and direct the RF energy through the auxiliary RF connector. This  
15 auxiliary external connector is usually attached to an external antenna. A typical application would be a vehicular charger which activates the internal RF switch to disconnect the radio/telephone antenna from the standard antenna, and conduct the RF energy to the auxiliary connector, which may be connected to another antenna mounted external to the vehicle. An external antenna greatly increases  
20 the operating range of the radio/telephone.

Alternatively, the process may be carried out manually by disconnecting the original antenna and attaching the remote antenna. The manual switching of the antennas, however, is cumbersome and time consuming for the user. The  
25 auxiliary coaxial connector and internal RF switch add size, complexity and cost to the radio/phone, and those who do not use the feature of the remote antenna must still pay for the extra components in their radio/phone.

The present invention relates to a coaxial accessory connector (CAC) which contains the auxiliary RF connector and its own internal RF switch. The CAC can be attached to and removed from the radio/telephone standard antenna port easily and quickly. The standard or original antenna is then mounted in a top port of the CAC. A radial or side entry port in the CAC allows the radio/telephone to be used with an accessory which activates the RF switch to disengage from the original antenna contact and to engage a contact in the side port. In this way, the RF signal is conducted to the accessory, e.g., another antenna, rather than to the unit's own standard or original antenna. When the RF switch is not activated by the accessory, the radio/telephone is used normally, with the RF signal carried through the CAC to the standard or original antenna.

More specifically, the CAC includes a housing with an axial port at its upper end and a radial or side port extending outwardly from the peripheral side wall of the housing. The axial port is adapted to receive a lower threaded connector of a standard radio/phone antenna such that the antenna contact extends downwardly into an area accessible by the side port. The CAC also incorporates an externally threaded shaft connector or stud, axially aligned with the top port, and projecting downwardly from the base of the housing. An electrical contact is secured within a contact housing or sleeve press fit within the lower part of the housing such that this contact projects below the housing. With this arrangement, the CAC can be threadably inserted into a radio, phone or other communications device in the same way as the standard device antenna. A lock nut is threadably mounted on the shaft and is utilized to firmly lock the CAC in place on the device.

A leaf spring contact is fixed to the upper end of the CAC electrical contact and extends upwardly at an angle (relative to a longitudinal axis

extending through the top port and the threaded CAC connector stud) so as to be normally engaged by the antenna contact to transmit RF energy between the device and the antenna.

5           The side port is formed in the CAC so as to extend substantially perpendicularly to the top port, such that the side port bore intersects the top port bore in the area of the leaf spring contact. The side port is provided with a contact housing which encloses a spring loaded, sliding contact which projects outwardly from opposite ends of the housing. Thus, one end of the contact  
10 extends toward the side port entry end and is adapted to engage a contact in an accessory, for example, another external antenna (or other device) upon insertion of that device into the side port. The opposite end of the sliding contact extends into the axial port area and is adapted to engage the leaf spring contact. Accordingly, when an accessory is loaded into the side or radial port of the CAC  
15 housing, one end of the sliding contact will engage the leaf spring contact and move it away from the antenna contact, thus establishing a new contact with the accessory so that the RF energy from the device is now channeled through the CAC to the accessory device. Upon removal of the accessory, the sliding contact will move away from the leaf spring contact, allowing the latter to move back  
20 into engagement with the original antenna contact.

          Accordingly, in its broader aspects, the present invention relates to a coaxial accessory connector adapted to fit within an antenna port of a communications device, the coaxial accessory connector comprising a housing  
25 having a first port and a first conductor element; a second port including a second conductor element; and a switch element connected to the first conductor element and, in a first position, engageable through the first port, and wherein the second conductor element is engageable through the second port and movable into

contact with the switch element to move the switch element away from the first position.

Additional objects and advantages will become apparent from the detailed  
5 description which follows.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a side elevation of the coaxial accessory connector in  
10 accordance with the present invention, shown with an antenna attached; and

FIGURE 2 is a partial side section of the coaxial accessory connector  
shown in Figure 1.

15

### **DETAILED DESCRIPTION OF THE DRAWINGS**

Referring to Figures 1 and 2, the CAC 10 includes a housing 12 with an  
axial or top port 14 at its upper end, and a radial or side port 16 extending  
20 outwardly from the peripheral side wall 18 of the housing. The axial port 14  
includes a counterbore 20, internally threaded at 22, and adapted to receive a  
lower threaded connector 24 of an antenna 26. An electrical contact 28 for the  
antenna extends below the connector 24 and into an area accessible by the side  
port 16.

25

It will be understood that the antenna 26 is initially threaded into a mobile  
a cellular telephone, radio or other device (not shown). In other words, the CAC  
device 10 of this invention is not (necessarily) intended to include its own

antenna. Rather, the CAC 10, in the exemplary embodiment, permits a user to remove the antenna 26 from its own device, so that the CAC of this invention can be attached to that device in place of the antenna. Accordingly, the lower axial end of the CAC 10 is designed for threaded attachment to the same port in the device that would normally accept the antenna 26. To this end, the CAC 10 incorporates an externally threaded shaft connector or stud 30, axially aligned with the port 14 and projecting downwardly from the base 32 of the housing 12. An electrical contact 34 is secured within a contact housing or sleeve 36 press fit within the housing 12, such that contact 34 projects below the housing. Thus, the stud or shaft 30 can be threadably inserted into the device port in the same way as the device antenna 26, i.e., the connector 30 and contact 34 mimic the connector 24 and contact 28. A lock nut 38 threadably mounted on the shaft 30 is utilized to secure the CAC 10 in conventional fashion to the device.

Note also that a leaf spring contact 40 is fixed to the opposite end 36 of contact 34 and extends upwardly at an angle to vertical so as to be normally engaged by the antenna contact 28 to thereby transmit the RF signal between the device and the antenna 26. In this regard, it is to be noted that a longitudinal axis through the axial port 14 intersects a radial axis through the side port 16 at a point adjacent the approximate mid-point of the leaf spring contact 40.

The side port 16 is formed in the CAC 10 by drilling a transverse hole 40 through the device, counterbored at both ends. Thus, at the port entry end, a radial flange 44 provides a stop for a contact housing 46 press fit or otherwise secured within the hole 42. The contact housing 46 encloses a spring loaded, sliding contact 48 which projects outwardly from opposite ends of the housing 44. The contact 48 includes a first contact portion 50 adapted to engage a contact in an accessory (another antenna or other device, not shown) upon insertion into

the side port. A reduced diameter portion 52 of the contact 48 extends into the axial port area, and is adapted to engage the leaf spring contact 40 in the manner described below. At the entry end of the port 16, contact housing 44 is sealed vis-a-vis the contact by a bronze disk or washer 54, while the back end is  
5 similarly sealed by a second but smaller disk or washer 56. The contact itself has a larger diameter portion 58 on which is seated a coil spring 60, the latter engaging a radial flange 62 at one end of portion 58. The opposite end of the spring 60 bears on the disk 56, thus tending to bias the contact 48 away from the leaf spring contact 40 (to the right as shown in Figure 2).

10

The opposite end of the hole 40 is closed by a plug 64. It will be appreciated here that the through bore nature of hole 42 is dictated only by manufacturing concerns, and thus, the plug 64 is considered permanent.

15 An O-ring 66 is seated within a groove 68 in the radial port 16, upstream of the contact end 48, and serves to engage the accessory plugged into the port, thus sealing against the entry of dirt or debris. The O-ring is captured within the groove 68 by surrounding sleeve 70.

20 In use, a user desirous of attaching an accessory to a mobile or cellular phone or radio or like device would initially remove the antenna 26 from the device, insert the CAC 10 in the antenna port of the device, and re-attach the antenna 26 to the CAC 10 as shown in the Figures. In this arrangement, the RF signal is conducted to the antenna 26 in the usual fashion, but through the CAC  
25 10. When an accessory is loaded into the side or radial port 16, the end 52 of contact 48 will engage the leaf spring contact 40 and move it (to the left as shown in Figure 2), thus breaking the contact with antenna contact 28 and establishing a new contact with the accessory via contact 52. Upon removal of the accessory,



spring 60 will move contact 48 to the right, allowing the leaf spring 40 to re-engage contact 28 of the antenna 26.

While the invention has been described in connection with what is  
5 presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

**WHAT IS CLAIMED IS:**

1           1. A coaxial accessory connector adapted to fit within an RF port of a  
2 communications device, said coaxial accessory connector comprising:  
3           a housing having a first port and a first contact element;  
4           a second port including a second contact element; and  
5           a switch element located in said housing and connected to said first  
6 contact element and, in a first position, engageable through said first port, and  
7 wherein said second contact element is engageable through said second port and  
8 movable into contact with said switch element to move said switch element away  
9 from said first position.

1           2. The coaxial accessory connector of claim 1 wherein said switch  
2 element comprises a leaf spring.

1           3. The coaxial accessory connector of claim 1 wherein said second  
2 contact is biased toward said second port.

1           4. The coaxial accessory connector of claim 3 wherein said second  
2 contact is slidably mounted in a housing secured within said second port

1           5. The coaxial accessory connector of claim 4 wherein said first contact  
2 is fixed within said housing and extends below a fastener coupling adapted to  
3 secure said housing to the port of the communications device.

1           6. The coaxial accessory connector of claim 5 wherein said first port and  
2 said fastener coupling are in axial alignment.

1           7. The coaxial accessory connector of claim 6 wherein said second port  
2 extends substantially perpendicular to said first port.

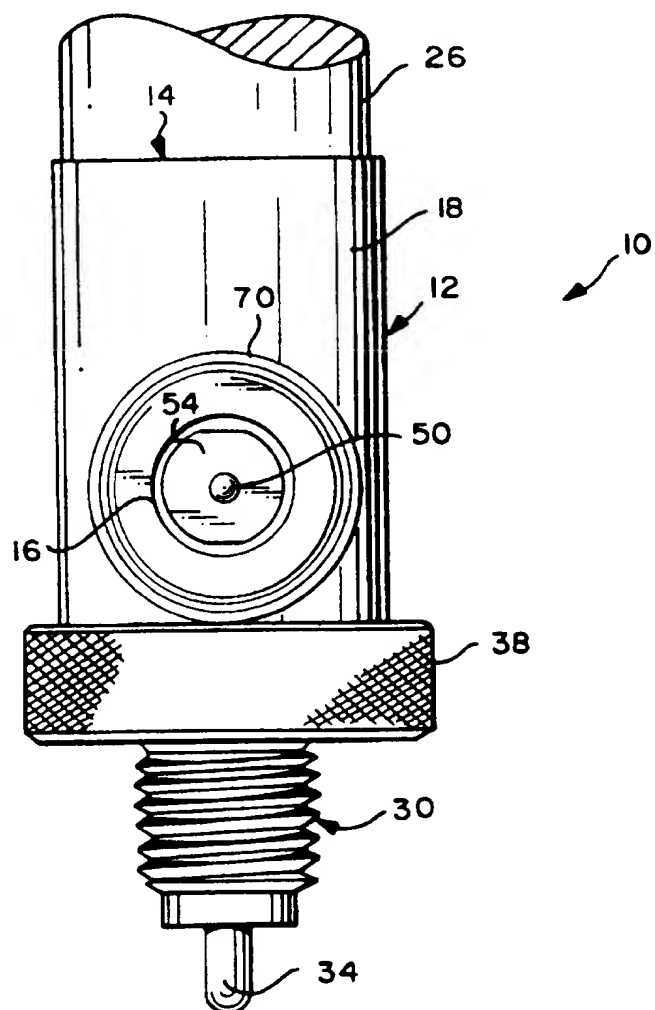
1           8. The coaxial accessory connector of claim 1 wherein said first port and  
2 said fastener coupling are in axial alignment.

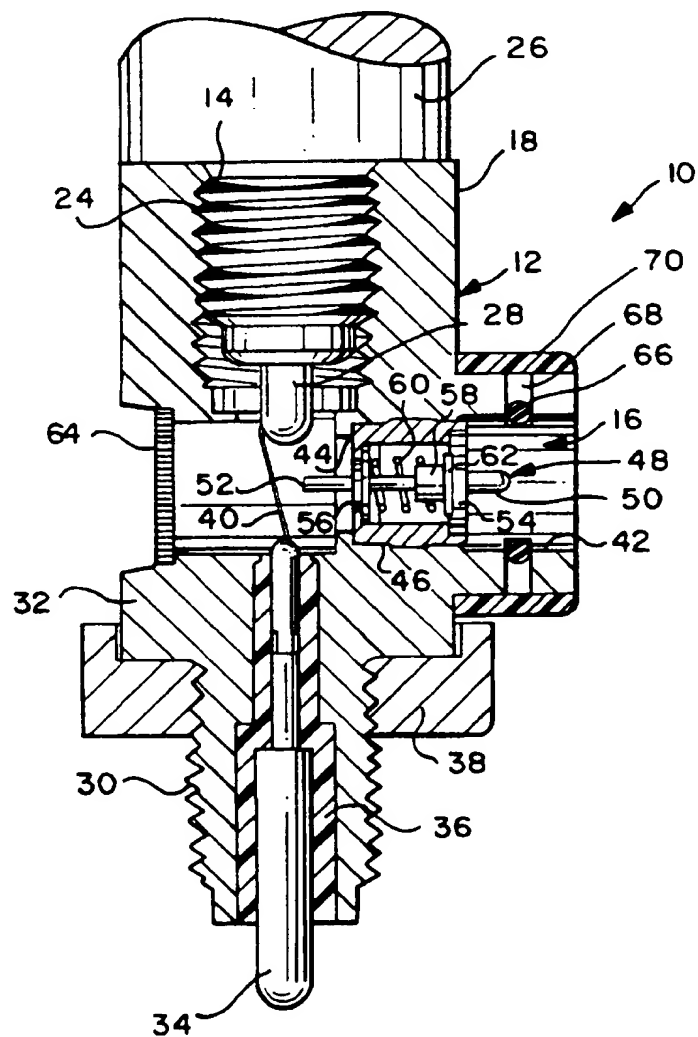
1           9. The coaxial accessory connector of claim 1 wherein said second port  
2 extends substantially perpendicular to said first port.

1           10. A coaxial accessory connector comprising a housing having a first  
2 port axially aligned with a first connector, said connector adapted for attachment  
3 to an external RF port of a communications device; a second RF port in said  
4 housing arranged perpendicularly to said first port and intersecting said first port;  
5 an internal RF switch including a movable switch element extending from a first  
6 electrical contact extending through said first connector and adapted to be  
7 engaged by a contact of an antenna mounted in said first port; and a second  
8 electrical contact slidably mounted on said second port, said second electrical  
9 contact adapted to move said switch element out of engagement with said antenna  
10 contact upon insertion of an accessory device in said second port

1           11. The coaxial accessory connector of claim 10 in combination with the  
2 communications device wherein said antenna can be threadably received in either  
3 said first port or said external RF port.

1/2

*Fig. 1*

*Fig. 2*

# INTERNATIONAL SEARCH REPORT

Intern. Application No.  
PCT/US 96/20002

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H01R17/12 H01R13/703

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 222 493 A (TECHNOPHONE LTD) 7 March 1990 see the whole document -----	1-11

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \* "A" document defining the general state of the art which is not considered to be of particular relevance
- \* "E" earlier document but published on or after the international filing date
- \* "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \* "O" document referring to an oral disclosure, use, exhibition or other means
- \* "P" document published prior to the international filing date but later than the priority date claimed

- \* "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \* "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \* "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \* "&" document member of the same patent family

Date of the actual completion of the international search

19 March 1997

Date of mailing of the international search report

26.03.97

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Salojärvi, K

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 96/20002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
---	---------------------	----------------------------	---------------------

GB 2222493 A

07-03-90

NONE